	Wing. mm.	Tail. mm.	Bill. mm.
Mus. Brit.			
7. "♂." Chamicuros, N.E. Peru, June 3, 1867. E. Bartlett coll.	49	22	$9\frac{1}{2}$
8. —. Xeberos, N.E. Peru. E. Bartlett coll.	48	24	$8\frac{3}{4}$
9. —. Sarayaçu, E. Ecuador, C. Buckley coll.	49	22	10
10. —. „ „ „	52	26	11
Mus. Branicki.			
11. "♂" ad. Yurimaguas, N.E. Peru, Feb. 28, 1881. Stolzmann coll.	49	21	11
Mus. Tring.			
12. "♂" juv. Nericagua, Orinoco, Apr. 7, 1899. Cherrie coll.	48	22	9
13. "♀" ad. Nericagua, Orinoco, Apr. 7, 1899. Cherrie coll.	$47\frac{1}{2}$	24	10
14. "♂" ad. Suapure, Caura R., Apr. 5, 1900. S. Klages coll.	$50\frac{1}{2}$	$24\frac{1}{2}$	9
15. Native Bogotá collections	50	27	$9\frac{1}{3}$
16. „ „ „	50	28	10
17. „ „ „	$50\frac{1}{2}$	23	10
18. „ „ „	51	25	10
19. „ „ „	51	23	10
20. „ „ „	48	23	(Damaged.)

II.—*Ostrich-farming in South Africa.*

By the Hon. Arthur Douglas*.

The domestication and farming of Ostriches for the production of feathers was first commenced in South Africa in 1867. Previously to that date no Ostrich had ever been bred or reared there in a tame state, though a few captured wild birds had been kept in confinement in Zoological Gardens. The idea was universal that the Ostrich would not make a nest and sit in captivity; hence the first efforts at hatching and rearing were made with incubators, and this system was brought to very great perfection, ninety

* [This paper was read in Section D at the Meeting of the British Association at Cape Town, August 17th, 1905, and was kindly communicated to us by the Author, who, we much regret to hear, has since died.—Edd.]

per cent. and upwards of the eggs put into the incubators being hatched. This method was largely pursued for many years.

Previously to 1867 the world's supply of Ostrich-feathers was obtained by the destruction of wild birds, and this destruction was proceeding at such a pace that, had it not been for successful domestication, the Ostrich would ere this have probably been nearly extinct in the Colony.

Ostrich-farming is practically confined to the Cape Colony. It only exists to a very limited extent in the other Colonies of South Africa. Efforts have been made to start it in Egypt, New Zealand, Australasia, South America, and California, but with very doubtful success; whilst in the Cape Colony it has been a continuous success from the first.

In 1880 the Colony's export of Ostrich-feathers was 163,065 lbs., about one-eighth of which was from wild birds. In 1904 the export was 470,381 lbs., practically the whole of which was from tame birds. The census of 1891 gave 154,880 as the number of tame birds in the Colony, whilst the census of 1904 gave 357,970; so that in the last twelve years the figures have more than doubled. This rapid increase has been mainly due to the remarkable freedom from disease that the Ostrich has shown under domestication, whilst all other stock in South Africa has suffered terribly from diseases produced by the "stock-scourge."

As yet, the Ostrich, when farmed in favourable environment, has only shown a susceptibility to five diseases. These are:—

1. *Strongylus douglasi*: by far the most fatal of all. This is caused by a thread-worm adhering in great numbers to the gastric glands, and killing its host by totally destroying its powers of digestion. It was first observed in 1879. No cure has been found, and it is very fatal to large numbers of birds when their environment is unsuitable.

2. "Yellow liver": an infectious fever, prevalent in chicks up to four months old, and often fatal when they are overcrowded or exposed to excessive moisture.

3. "Tape-worms": now nearly always found in large numbers in all Ostriches up to two years old. This disease is easily kept under by regular fortnightly dosing with turpentine, and is only fatal if neglected or when in conjunction with *Strongylus douglasi*.

4. "Ostrich-fly": a disease that came from the north about twenty years ago; it is becoming worse, and may yet be very serious. The fly is easily killed by spraying the birds with water and five per cent. of paraffin mechanically mixed, or by dipping the birds in a decoction of nicotine; but the life-history of the fly is not known, and it soon reappears again.

5. Lice, which are found in myriads on neglected birds; they injure the feathers and reduce the condition of the hosts. They are easily destroyed by spraying or dipping.

There are now two well-defined methods of Ostrich-farming: the one by grazing the birds on fields of lucerne under irrigation, when five of them can be kept to the acre; the other by letting them find their own food in large camps of three thousand acres and upwards in size, allowing from ten to twenty acres for each bird.

In the former case the drawback is the great cost of land laid down with lucerne and under permanent irrigation; it varies from £50 to £100 per acre. In the latter plan the objections are the greater loss of birds from accidents and straying, and the cost of feeding them in very severe droughts.

Oudtshoorn is the principal seat of the Ostrich-industry on irrigated land, one-quarter of all the tame birds being found there. The second method is mainly adopted on the coast west of East London, and up the large river-valleys to an altitude not exceeding 3000 feet above sea-level.

The feathers of the chicks are usually pulled when the birds are eight months old; then, six and a half months afterwards, the primary feathers are cut, and the tails (blacks and drabs) pulled; two months later the quills of the cut feathers are pulled. This gives nearly three pluckings in

two years. Birds should average from 1 lb. to 1 lb. 3 oz. of feathers at each plucking, or about 1½ lbs. a year.

The census taken in April 1904 gave 357,970 birds in the Colony, whilst the export of feathers for the year was only 470,381 lbs., equal to 1⅓ lbs. per bird; but as from the total number of birds must be deducted those that die during the year and those which have not arrived at full feather-producing age, the production was fully 1½ lbs. per adult bird per annum.

The value of feathers exported in 1904 was £1,058,988, giving £2 19*s.* 6*d.* per bird including chicks, or about £3 10*s.* 0*d.* per bird of feather-producing age. The greatest weight of feathers per bird was produced where irrigation was used and in districts where the veldt was soft. The least weight was obtained on the hard Karoo and at high altitudes. Birds of very superior quality are now being bred, no price being thought excessive for good birds for breeding purposes. As much as £1000 was lately given for a pair, and from £200 to £300 is not so very uncommon, whilst the price of ordinary birds is from £5 to £10 each, and of chicks from £2 to £4.

I have mentioned that in the early years of Ostrich-farming artificial hatching was very extensively practised. This was owing to the great demand for birds and to the very limited number in South Africa old enough to breed, namely, of four years in age. Every effort was made to get the greatest possible increase, and this was obtained by feeding the old birds heavily and not allowing them to sit. Thus they kept on laying all the year round. But as the number of old birds increased and the value of chicks decreased this method became less profitable. Moreover a great tendency to "yellow-liver" sickness was shown when excessive numbers of chicks were reared by hand on one homestead, and now the practice of artificial hatching has been quite abandoned, and the hatching and rearing is done entirely by the parents. The birds begin nesting in July, and lay from twelve to sixteen eggs each, which are hatched in six weeks, the hen sitting by day and the cock by

night, excepting in wet weather, when the cock sits day and night.

One of the difficulties of the Ostrich-farmer, especially when letting his birds graze in large camps on the natural veldt, is their tendency to get wild and unmanageable. This tendency is not so bad as it was in the early days, but whether the innate wildness and fear of man has been lessened by the domestication of the parents for several generations is very doubtful. If half a nest of eggs from tame birds were put into a wild Ostrich's nest, I do not think that there would be the slightest difference in the chicks when they were hatched as regards wildness. When first a brood of chicks is approached, and the parent birds give the note of alarm, the nestlings run and drop flat in any little depression they find in the ground. When picked up they remain limp and sham being dead, in exactly the same way as wild chicks do. But as soon as the parent birds allow a man to approach them, and begin feeding round him, the chicks quickly imitate their parents and in a few hours shew no more fear of man than they do. If a lot of chicks is taken straight away before they have left the nest, and put along with another lot of chicks, they will all be just as wild or tame as the foster-parents are—no matter how wild their real parents may have been.

The hen when sitting is perfectly tame and harmless, but as soon as the chicks are hatched she becomes very fierce. I once had a curious instance of this change in the hen. Some men were working at a fence close to a sitting hen Ostrich. She paid no attention to them till one day she sprang from her eggs and knocked one of the men down, very severely injuring him. On examining the nest, I found in one egg a chick which squeaked; and this had, no doubt, caused the sudden change of behaviour in the hen. The cock bird is always savage during the period of incubation, and will fight furiously to keep men away from the nest. When once you are at the nest and begin handling the eggs he ceases to fight, and adopts a piteous supplicating attitude, as though he were beseeching you not to break the eggs;

but directly you put them down and begin retreating from the nest, he fights worse than before.

The process of sexual selection, by which the stamina of the bird and the beauty of its feathers are kept up, is very marked in the Ostrich. As the breeding-season comes on, the cock begins to disport himself before the hens. Dropping on his haunches, he distends his wings like two huge fans, and rolling his head from side to side makes every feather quiver. Then, jumping up, he utters three bellows that much resemble the roar of a lion, as a challenge to any other cock to come and fight; this he continues for some days, till a hen accepts him and they pair off. The breeder, by careful selection and by keeping pairs together, can manage affairs more quickly. At the same time he is met by considerable difficulties. A cock and a hen, both superior birds and obtained from well-established strains, may be mated, and yet the resulting chicks may be very disappointing, while it may be years before a consort for either parent is found to produce satisfactory chicks. When a pair are satisfactorily mated, the strain is easily maintained by inbreeding; but the usual consequences of inbreeding—weak constitution and barrenness, or chicks difficult to rear—soon become manifest.

In 1880, with an annual production of 163,065 lbs. weight, the export value of Ostrich-feathers per lb. was £5 8*s.* 4*d.*; in 1904, twenty-four years later, the production was 470,381 lbs., with a declared export value of £2 5*s.* 0*d.* per lb.; so that in twenty-four years the production had increased nearly threefold, and the price had fallen to nearly one-third. In fact, it seemed as if further increased production would be followed by a corresponding fall in value. But this will not necessarily be so, as during the last twelve years, although the production has been steadily increasing, the value of feathers per lb. has remained much the same. Thus it looks as though the world's increased demand were able to absorb the present rate of increased supply, and it is doubtful if South Africa is capable of increasing the production at the

same rate as in the past twelve years. The best of the country for Ostrich-farming—that is, where the rainfall is not over 20 inches, with a rich soil, shelter from high winds, and no extremes of temperature—is now pretty fully stocked, and further increase must come from parts not so well adapted to the industry or from more land being put under irrigation and lucerne. Still the difficulties are such that this area can only be extended very slowly. It would therefore seem that, so far as the capabilities of South Africa go, the rate of increased production is not likely to exceed the requirements of the trade. With the superior feathers now beginning to be produced, it is probable that the trade will demand the better and neglect the inferior feathers; and as the Cape Government exacts an export duty of £100 a bird, the superior birds will be found only in South Africa. There are also great difficulties to be overcome in starting the industry successfully in other countries. We have seen that the birds during the breeding-season are very fierce and dangerous, and it is difficult to get labourers not used to the work to have anything to do with them. Besides which there are few industries in which skill and knowledge in selecting the birds have so much to do with the success of the undertaking. Not only to establish a troop of Ostriches but to maintain it up to a good standard requires the constant weeding-out of inferior birds; and in a new country, with no removal of the less fit, the birds would rapidly deteriorate.

It may be said that all these difficulties had to be overcome in the Cape Colony. But it should be recollected that for the first few years after the industry was started the birds produced feathers at each plucking of from £10 to £12 in value, so that costly mistakes could be more easily borne; but now, with pluckings averaging £3 for a bird, mistakes would make the business a loss. So we may presume that there will not be any sudden or large production in other countries, and that this industry will continue to be very lucrative in the Colony for many years.